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TITLE: **California's Parkinson's Disease Registry Pilot Project – Coordination
Center and Northern California Ascertainment**

PRINCIPAL INVESTIGATOR: **Caroline M. Tanner, MD, PhD**

CONTRACTING ORGANIZATION:

**The Parkinson's Institute
Sunnyvale, California 94085-2934**

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A. Introduction

This project consists of a pilot study conducted in partnership with the California Department of Public Health (CDPH) and the University of California-Los Angeles School of Public Health (UCLA) to implement a legally mandated statewide population-based Parkinson's disease (PD) registry in California to serve health surveillance and research aims. As the coordinating center for the surveillance activities, the Parkinson's Institute developed and implemented policies and procedures, established policies and procedures in accordance with state regulations, developed and implemented ascertainment methods, developed staff training methods and tools and conducted training for staff in the northern and southern California sites, developed, pilot tested and implemented data collection tools, prepared a secure database, and carried out registration and of cases with ICD-9 codes 332.0, 332.1, 333.0, 331.82. Case ascertainment was conducted using an active ascertainment approach. Providers and large medical groups and facilities were asked to provide lists of individuals with service contacts associated with one of the ICD-9 codes above. Ascertainment activities have been completed in the four target counties in northern and southern California (Santa Clara, Kern, Tulare, Fresno). Approximately 10,000 unique PD cases have been identified to date. Systematic de-duplication procedures have been used to ensure unique entries. Registry content was validated (i.e. confirmation of diagnosis and other qualifying criteria) and the quality and completeness of registry data was assessed using census, Medicare and death certificate data. Prevalence estimates for residents of the 4 counties in 2007 were computed overall and by region. Age- and gender- specific rates were estimated. Information obtained by active ascertainment in the registry was compared to information obtained from Medicare (CMS) for the same counties for the year 2007. Prevalence estimates based on CMS data were determined.

B. Body

The goals of this project were to conduct a feasibility study for the legally mandated California statewide population-based PD registry and utilize pilot registry data to explore trends in PD prevalence, patterns of care, possible relationship to the distribution of environmental toxicants, stakeholder priorities and cost efficiency of operations. This project is linked with a USAMRMC-funded project based at UCLA (Award Number W81XWH-07-1-0005, Principal Investigator: Beate Ritz), under which case ascertainment in Southern California and exploratory analyses were performed. The current report summarizes the activities of the coordination center, located at the Parkinson's Institute in Sunnyvale, California. These activities were development of registry procedures and policies, establishing the registry infrastructure, conducting active ascertainment of cases in northern California (Santa Clara County) and receiving data obtained from southern California (Kern, Tulare, Fresno Counties), data management, including data cleaning and resolution of discrepant or incomplete data collected from providers, identification of individuals represented in more than one source, producing a final roster of unique individuals, reporting descriptive information and estimating Parkinson's disease prevalence for 2007. In addition, information received from CMS for 2007 was compared to registry data to determine completeness of ascertainment. Prevalence estimates based on CMR data and using all unique cases in both datasets were determined for 2007.

C. Key Accomplishments

1. <u>Deputization status from the CDPH as designated agents for creation of a state registry:</u> Zero-dollar contracts between CDPH and The Parkinson's Institute (TPI) were developed, and signed in October, 2007.

2. <u>Approval from Institutional Review Boards:</u> Human subjects research waivers for the initial surveillance-oriented work were obtained from the Army Medical Research and Materiel Command Office of Research Protections Human Research Protection Office, the State of California Committee for the Protection of Human Subjects (CPHS), the Kaiser Permanente Northern California Institutional Review Board and the UCLA Office for Protection of Research Subjects. CPHS also authorized work to link registry data with Medicare data from the Center for Medicare and Medicaid Services (CMS), in order to evaluate the efficiency of the registry ascertainment methods utilizing capture-recapture analytic methods. A joint TPI-UCLA application to conduct exploratory analyses (evaluating diagnostic validity, linkage to toxicant databases, defining patterns of PD care) was approved by CPHS.

3. <u>Notification of case reporting sources and professional organizations of registry implementation, as required by the California Parkinson's Disease Registry Act:</u> A formal notification letter was developed in conjunction with CDPH, and mailed on January 2008 to the state Medical Board and the Board of Pharmacy, professional organizations representing potential case reporting sources (pharmacists, physicians and health care facilities) and public health officers in the project target counties. Inquiries from reporting sources/organizations about the registry have been addressed via email, telephone and in public and scientific gatherings.

4. <u>Conduct outreach to stakeholders:</u> A public stakeholders' meeting was convened in March, 2006. A freestanding website (www.capdregistry.org) and email box were created and launched in March, 2008. Requests for information about the registry from patients, colleagues and the public have consistently been answered within several days of receipt. A public fact sheet and informational brochure were developed and have been utilized in mailings, at patient-oriented events and are also posted on the website.

5. <u>Convene a Stakeholders' Advisory Committee:</u> Under the direction of its founding leaders, Mr. Mark Siegel , Mr. Greg Wasson and Ms. Anne Wasson , a committee maintained a network to inform stakeholders of project activities, provide valuable input to the project and strategize about future funding and expansion opportunities for the registry. Additional committee members are Dr. James Wong and Dr. Ronald Kobayashi. Stakeholder's Committee Teleconference meetings were conducted as possible. Email communication was used otherwise to review project strategies and project output.

6. <u>Define case ascertainment strategies:</u> Investigators at TPI and UCLA developed lists of providers in the 4 county pilot project region. They initiated case ascertainment activities by approaching physician offices (neurology practices in particular), medical groups and large health care facilities, to enhance the willingness of these high-yield sources to cooperate with the reporting requirements.

7. <u>Creation of tools and instruments for data collection:</u> A data collection form and Microsoft Access database was developed and pilot-tested by staff (both physicians and non-physicians) at TPI. The form includes fields for obtaining information on basic demographics, key clinical parameters, characterization of data collection feasibility and data reliability.

8. <u>Establishment of a secure registry database</u>: A secure, non-networked data repository was established in a dedicated office with access limited to trained project personnel.

9. <u>Develop policies and procedures for ensuring data confidentiality, quality and appropriate use:</u> Policies and procedures were developed, together with staff training materials. TPI and UCLA project employees attended group training sessions in September and October, 2008 and again in June and July of 2009. Following the launch of field data collection in October, 2008, weekly conference calls were held to keep all field staff updated on progress and the latest standard operating procedures on safe data collection/transmission and storage. In addition, all registry staff members completed Information Security training on a yearly basis.

10. <u>Hiring and training staff:</u> Registry staff members were hired and trained in communication with potential reporting sources, project security procedures, data collection and clinical abstraction. In addition, weekly conference calls between TPI and UCLA staff members and principal investigators provided a mechanism to keep all registry staff updated on progress and the latest standard operating procedures for field work and data safety.

11. <u>Active case ascertainment and data collection in designated counties</u>: For the southern California region, cases were reported from 2007 to 2012. For the Northern California region, cases were reported from 2006 to 2010. The difference in reporting periods reflects the additional support in Southern CA which allowed continuous surveillance. To maximize efficiency given the limited resources in Northern CA, two rounds of active ascertainment separated by several years were conducted. The first ascertained cases with health service contacts including the ICD codes 332.0, 332.1, 333.0 and 331.82 from 2006 to 2010, and a second requesting case from 2006 to 2013. In this report only the 2006 to 2010 results are included (see Table 1). The ascertainment window was longer than the prevalence year (2007) to allow more complete ascertainment.

12. <u>Provider Compliance:</u> Registry staff contacted individual providers, citing the law mandating reporting of Parkinson's disease. Compliance with reporting requests by large providers (hospitals, large medical groups) was 100% in northern California and slightly lower in southern California. In both regions, reporting involved numerous contacts by registry staff. About two thirds of the smaller practices approached provided reports. Of the non-complying practices, about 40% stated that they were unable to provide a list because they had no way to search their records for specific ICD-9 codes, 40% refused, citing privacy concerns, and 20% stated they did not treat persons with Parkinson's disease.

13. <u>Development of systematic de-duplication procedures</u>: Because cases were ascertained from multiple reporting sources, some cases were reported more than once. Utilizing the CDC's LinkPlus software platform, procedures were developed to compare all new

incoming data against existing registry data to identify duplicate cases in the database. Cases reported in multiple sources were counted only once. This ensures a more accurate estimate of the cases within the designated reporting areas.

14. <u>Activation of voluntary patient self-registration</u>: A mechanism for self registration has been established. Interested patients can print a registration form directly from the registry website (http://www.capdregistry.org/NewPatient.html). This completed registration form is then mailed or delivered to the registry, so that no personal health information is provided online.

15. <u>Application for external validation data</u>: Assessment of registry validity and ascertainment efficiency was determined through linkage with external datasets listing Parkinson's disease cases. Applications were filed for Medicare data with the University of Minnesota Research Data Assistance Center/CMS, and with the California Vital Statistics Advisory Committee/CPHS for death certificate data. Both applications were approved. Receipt of Medicare data from CMS was significantly delayed due to administrative barriers on the part of CMS. The 2007 Medicare dataset was received in 2011.

16. <u>Preparation of analytic datasets:</u> Preparation of the analytic datasets which include the dataset for the capture-recapture analytic work and the dataset for prevalence reporting work was completed. This work involved:
    a. Review and rectification of discrepant diagnosis information reported by providers for cases within and across data sources. 1422 cases with approximately 17,000 service records have been reviewed to rectify discrepant diagnoses reported to the registry project.
    b. Compiling and verification of vital status and residency in the 4 counties for the reported cases.
    c. Compiling and verification of the service temporality for the reported cases. Eligible cases for the prevalence estimates were resident in one of the four counties in the year of 2007. The break down of the reported cases by diagnosis and by prevalence for 2007 is reported in Figure 1. The demographic characteristics of the prevalent cases are reported in Table 4.
    d. Review and determination of study diagnosis. For cases with multiple parkinsonism codes (i.e. diagnosed with more than one of 332.0, 333.0, 331.82, or 332.1), a single code was determined for the year 2007 using a systematic, semi-structured algorithm. Individual "study diagnostic" codes were established for individuals with multiple codes in the registry dataset for the year 2007. A similar approach was applied independently for cases identified from CMS data. More than 15,000 service records were reviewed by Dr. C Tanner in order to determine the most likely diagnosis for each individual.

17. <u>Prevalence analysis</u>: Prevalence was estimated for calendar year 2007. The crude rates were determined overall and separately by region, age and gender. US census data for the year 2000 was utilized as the standard population for the population adjusted estimate. The estimated age and gender adjusted prevalence is reported in Table 3.

18. <u>Assessment of surveillance efficiency</u>: Prevalence case numbers and demographic characteristics derived from the California PD Registry (identified using active ascertainment from providers) were compared with the cases reported from the CMS

database (derived from claims reports). The results are displayed in Table 5 and Figure 5. Dr. Lorene Nelson (Stanford University) is completing a supplemental analysis, using capture-recapture methods for the California PD Registry data.

D. Reportable Outcomes

1. <u>Physician contacts:</u>

We identified and contacted 66 large medical groups and providers with combined hospital and outpatient facilities (4 hospitals with multispecialty group practices, 1 large multispecialty group practice, 1 specialty referral center) and 222 neurologists/small neurology-focused outpatient physician practices. In Southern California, active ascertainment included non-neurologist outpatient practices. In Northern California, resource limitations precluded this, but a few small non-neurologist practices were included because public data had erroneously indicated that a neurologist or neurosurgeon was a member of that practice. Of those providers of all types contacted in the four counties, 35 out of 66 medical groups/facilities and 57 out of 222 neurologists/small practices reported 14,517 records to the CA PD registry project (Table 1a.)

Table 1a. Types and Number of Providers Reporting, By Region

County	Northern California (2007-2010)	Southern California (2007-2012)			
	Santa Clara	Fresno	Kern	Tulare	Total
Individual Physicians in Outpatient Practices	18	15	16	8	57
Large Facilities and Multispecialty Groups	7	12	9	7	35

2.   Reporting by Region:

A total of 14,517 records were reported to the CA PD Registry. After removing duplications, (see C12, above) there were 10,490 unique individuals with at least one of the ICD-9 codes 332.0, 333.0, 331.82, or 332.1. Forty-two percent resided in Northern California (Santa Clara County) and 58% in Southern California (Fresno, Kern, and Tulare counties) (Table 1b).

Table 1b. Census 2000 Population and Number of Cases Reported Overall and by Region for Entire Ascertainment Period

	Northern CA* (2007-2010)	Southern CA** (2007-2012)			
Census 2000 Population County	Santa Clara	Fresno	Kern	Tulare	Total
Total Population (Census 2000)	1,764,499	909,153	800,458	426,276	3,900,386
		Total S. CA = 2,135,887			
Population >65 (Census 2000)	192,330	90,006	72,041	40,922	395,299
		Total S. CA = 202,969			
Reported Patients with Service Records including ICD-9 332.0, 332.1, 333.0, 331.82:					
Total Records Reported	5,527	3,083	3,599	2,308	14,517
Total Unique Patients Reported	4,407	2,234	2,374	1,475	10,490
% Unique Patients by County	42.0	21.3	22.6	14.1	100%

* In the Northern California region (Santa Clara County), providers were asked to report all service contact for cases with ICD-9 codes 332.0, 332.1, 333.0, or 331.82 during the period 2006 until the time of the request. For most, this interval was 2007-2010, but for a few providers, only 2007-2008 or 2007-2009 is represented
**In the Southern California region (Kern, Tulare and Fresno Counties), providers were contacted annually and asked to report all cases with ICD-9 codes 332.0, 332.1, 333.0, 331.82. Cases were identified during the period 2007-2012.

3.   Reporting by Provider Type:

Most individuals (80%) were reported by only one provider. Of these, solo-practitioner physicians and small practices accounted for 28% of unique cases, and large medical groups/facilities for 72%. Of the 20% of patients reported by multiple providers, the majority had been reported by at least one large facility (Table 2). 69 subjects had no address listed in the records reported by the providers, and were assumed to reside in the counties in which they had been reported.

Table 2. Unique Cases Reported by Provider Type and Region for Entire Ascertainment Period

	4 Counties		**Northern CA**		**Southern CA**	
	N	% of Total	N	% of Total	N	% of Total
Total cases Reported	**10490**	100.0	**4407**	100.0	**6083**	100.0
Case Reported by One Provider	**8399**	80.1	**3755**	85.2	**4644**	76.3
Large facilities and hospitals (including inpatient and outpatient services)	6046	57.5	2849	64.6	3197	52.5
Outpatient neurology practices	2050	19.5	878	19.9	1172	19.3
Outpatient practices – non-neurology	303	2.9	28	0.6	275	4.5
Case Reported by more than one Provider	**2091**	19.9	**652**	14.8	**1439**	23.7
Multiple large facilities/hospitals	528	5.0	386	8.8	142	2.3
Outpatient neurology + large facilities	1199	11.4	254	5.8	945	15.5
Outpatient non-neurology + large facilities	265	2.5	11	0.2	254	4.2
Outpatient neurology + non-neurology, with or without large facilities	99	0.9	1	0.0	98	1.6

4. Case Definition:

10,490 unique individuals were found who had at least one of the four ICD-9 codes of interest from the four counties where the PD Registry pilot project was conducted. Individuals for whom only one ICD-9 code was listed were considered to have that diagnosis. A movement specialist (Dr. C Tanner) reviewed the 1422 individuals initially presenting with more than one of these ICD-9 codes, using a semi-structured algorithm to determine the ICD-9 code associated with the most likely diagnostic categories. After this adjudication process, 9149 individuals (87.2% of all unique persons reported) were considered to have PD. 1119 individuals (10.7%) had ICD-9 codes for other forms of neurodegenerative parkinsonism. The remaining 2.1% were primarily drug-induced parkinsonism (Figure 1).

Figure 1. Cases Identified Overall and by Diagnostic Category
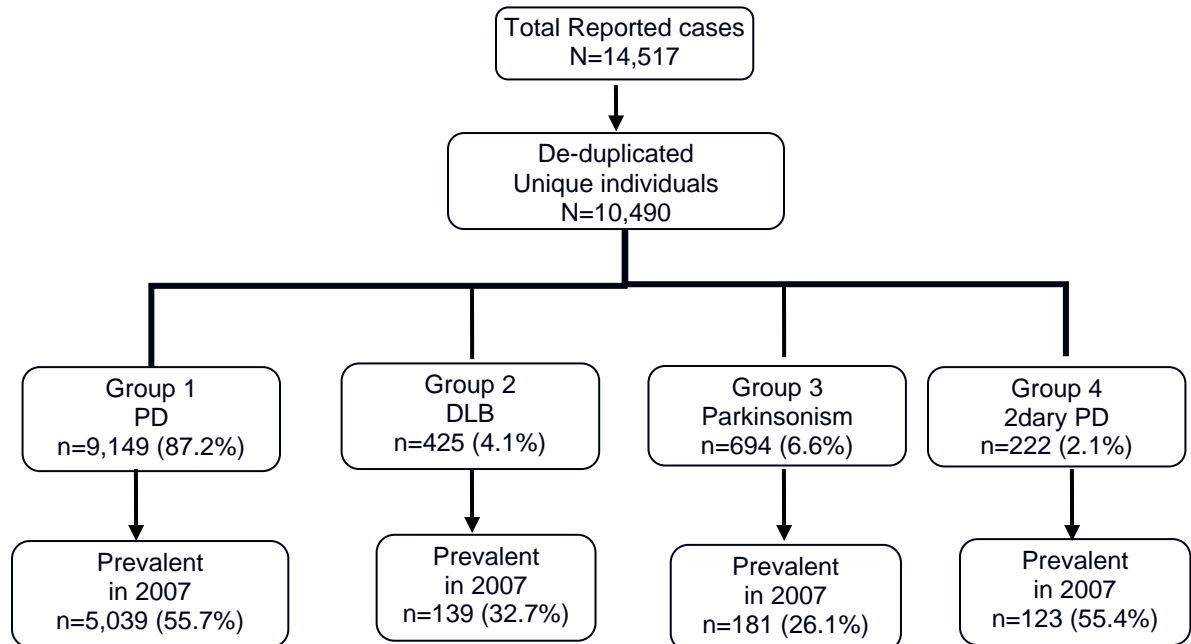
5. Determination of Residence Eligibility for the Prevalence period (2007):

Cases with service contacts and addresses in the 4 counties in 2007 were counted as prevalent. In addition, cases with service contacts in 2006 and at any time after 2007 and continuous residence addresses in one of the 4 counties for all of these service contacts were counted as prevalent in 2007 (n=740). For the year 2007, 5039 PD cases were considered to be resident in one of the 4 counties, representing 55.7% of the unique PD cases reported for the entire ascertainment period.

6. Prevalence Estimate for 2007:

Crude and adjusted annual prevalence rates and 95% confidence intervals were calculated per 100,000 persons, overall and by region, using the U.S. Census 2000 data for the population for each county. Rates adjusted for age and gender and 95% confidence intervals were calculated using direct standardization with the U.S. population reported in Census 2000. For all 4 counties

in 2007, estimated crude prevalence is 146.3 per 100,000. Prevalence adjusted to the US census 2000 for age and gender is 196.4 per 100,000 (95% confidence interval, 191.0-201.9) (Figures 2-3, Table 3). The crude prevalence of PD for the population aged 65 and over is 1308.6 per 100,000, and adjusted for age and gender is 1374.5 per 100,000 (95% confidence interval, 1333.0-1416.0).

Figure 2.   2007 PD Prevalence per 100,000 by Region Standardized Using US Census 2000
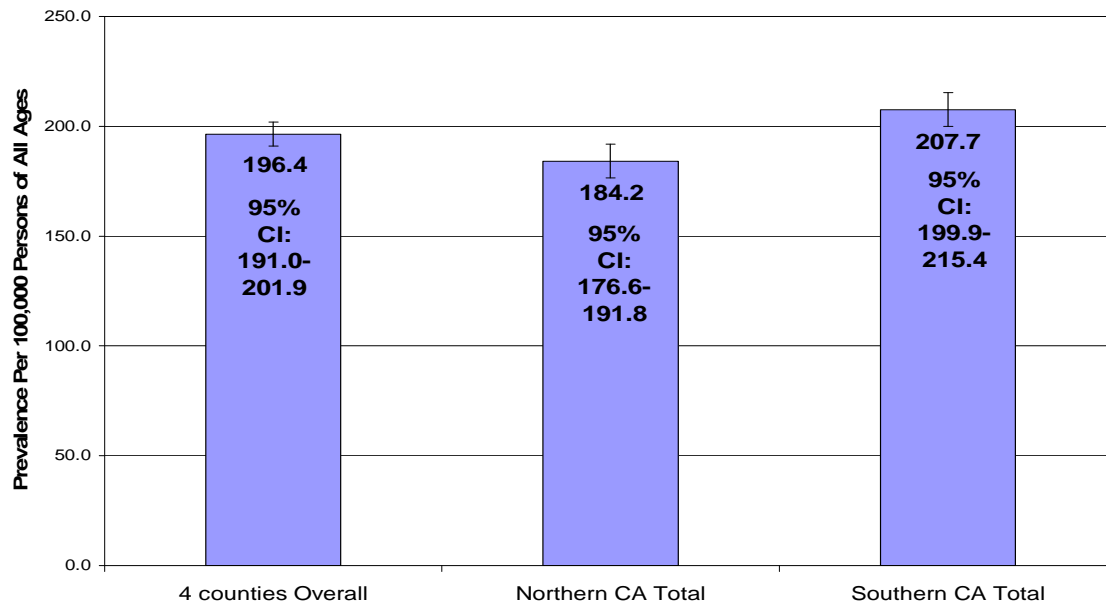
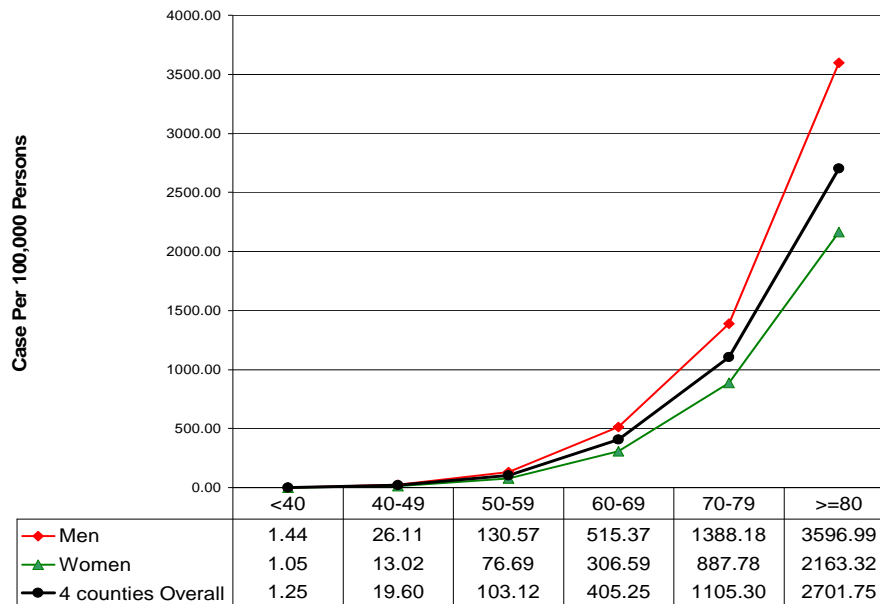Figure 3. Crude Age and Gender Specific Prevalence (4 counties combined)

	<40	40-49	50-59	60-69	70-79	>=80
Men	1.44	26.11	130.57	515.37	1388.18	3596.99
Women	1.05	13.02	76.69	306.59	887.78	2163.32
4 counties Overall	1.25	19.60	103.12	405.25	1105.30	2701.75

Table 3. Total Population Adjusted Prevalence per 100,000 in 2007*

	4 counties combined	Northern CA	Southern CA
Overall (age and gender adjusted)	196.4	184.2	207.7
(95%CI: low, high)	(191.0,201.9)	(176.6, 191.8)	(199.9, 215.4)
Male (age adjusted)	204.4	197.9	210.6
(95%CI: low, high)	(196.7, 212.0)	(187.0, 208.9)	(199.8, 221.3)
Female (age adjusted)	184.3	166.8	200.4
(95%CI: low, high)	(176.7, 191.9)	(156.4, 177.2)	(189.5, 211.3)

*Adjusted to US population from Census 2000

7.   Demographic characteristics of the prevalent PD cases.

Prevalent PD cases were 54% (2734/5024) male and had a mean age of 75 +/- 11 yrs in 2007 (range 16 – 102). 4220/5024 (84.0%) were age 65 or older in 2007 (15 had missing age and gender data). Among the cases with data on race available from health care providers (4359 out of 5039, 86.5%), 85.2% were white, 1.7% black, 9.8% Asian, 3.3% others (0.01% American Indian/Alaska Native, 0.2% Native Hawaiian/Pacific Islander, and 3.1% other).   Demographic characteristics were similar in the northern and southern regions, except that there were more cases reported as Asian in the northern and more reported as Hispanic in the southern region (Table 4).

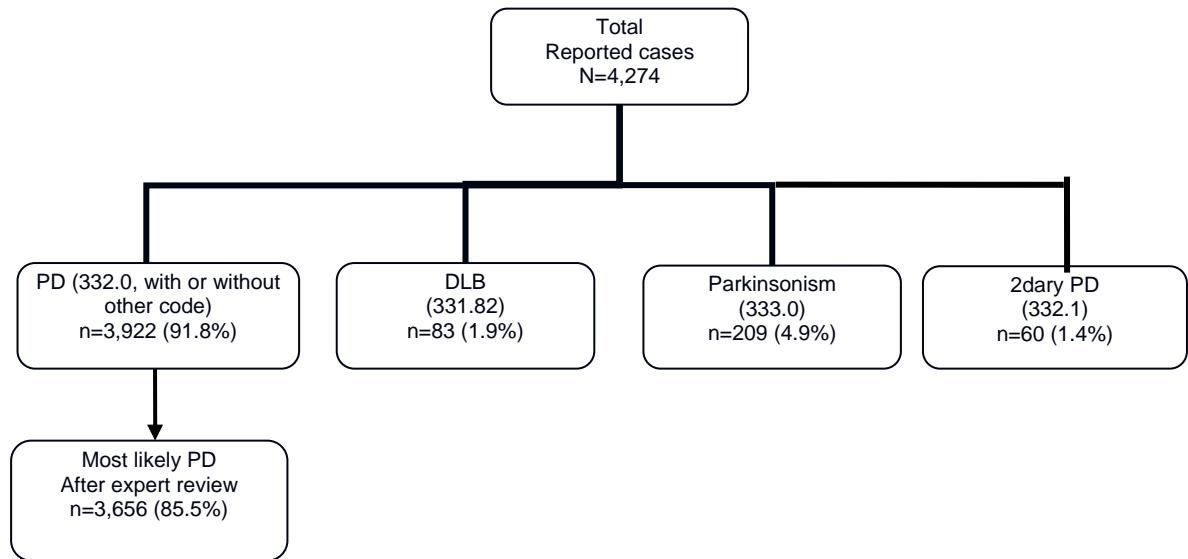Table 4 Demographic Characteristics of PD Subjects Prevalent in 2007

	Overall		Northern CA		Southern CA	
	n	%	n	%	n	%
Combined						
Total with age data	5024	100.0	2251	100.0	2773	100.0
<40	28	0.6	10	0.4	18	0.6
40-49	97	1.9	46	2.0	51	1.8
50-59	351	7.0	159	7.1	192	6.9
60-69	848	16.9	407	18.1	441	15.9
70-79	1700	33.8	756	33.6	944	34.0
80-89	1733	34.5	759	33.7	974	35.1
>=90	267	5.3	114	5.1	153	5.5
Male	2734	54.4	1256	55.8	1478	53.3
Female	2290	45.6	995	44.2	1295	46.7
Race						
Total with race	4359	100.0	1943	100.0	2416	100.0
White	3713	85.2	1495	76.9	2218	91.8
Black	76	1.7	25	1.3	51	2.1
Asian	427	9.8	366	18.8	61	2.5
Other	143	3.3	57	2.9	86	3.6
Ethnicity						
Total with ethnicity	2808		1089		1719	
Hispanic	368	13.1	87	8.0	281	16.3

8.   Medicare (CMS) cases reported:

Medicare utilization for the year 2007 for the 4 counties was reported based on claims data from inpatient, outpatient and skilled nursing facilities. All individuals resident in the four counties with one or more service claims including the ICD-9 codes 332.0, 332.1, 333.0 and 331.82 during the year 2007 were identified from inpatient and outpatient records by CMS. A total of 170,322 entries (service records) were reported in the datasets received from Medicare, representing 4,274 unique individuals. On average, each individual had 40 entries. Among the 4,274 individuals,

2109 of them (49.3%) were men and 93.7% were aged 65 and older. 77.8% were non Hispanic White, 9.8% Asian, 6.2% Hispanic, 2% Black, and 4.2% Others. For 80% of the cases reported by CMS, a single service record indicated a diagnosis of Parkinson's disease (ICD-9 code 332.0). For 8%, a single service record of parkinsonism (ICD code 332.1, 333.0 or 331.82) was reported. In 12% of cases, multiple service records were coded with diagnoses of Parkinson's disease and/or parkinsonism (Figure 4).

Figure 4. Cases Identified by Medicare Claims

Of the 4274 individuals with visits billed to Medicare for service related to one of the four ICD-9 codes, 3,922 were reported with claims indicating a PD code of 332.0, with or without another code of parkinsonism. Demographic characteristics of these 3,922 are shown in Table 5A.

Table 5A i. Age Distribution of All Cases with One or More
ICD-9 Codes of 332.0 (PD) Reported in CMS Claims Data

	Overall		Northern CA		Southern CA	
	n	%	n	%	n	%
Total	3922	100.0	1623	100.0	2299	100.0
Age						
<50	37	0.9	12	0.7	25	1.1
50-59	124	3.2	29	1.8	95	4.1
60-64	93	2.4	28	1.7	65	2.8
65-69	382	9.7	160	9.9	222	9.7
70-79	1356	34.6	559	34.4	797	34.7
80-89	1636	41.7	708	43.6	928	40.4
>=90	294	7.5	127	7.8	167	7.3
>=65 subtotal	3668	93.5	1554	95.7	2114	92.0

Table 5A ii. Gender, Ethnicity and Neurologist Utilization for
All Cases with One or More ICD-9 Codes of 332.0 (PD)
Reported in CMS Claims Data

	Overall		Northern CA		Southern CA	
	n	% Total	n	% Total	n	% Total
Male	1959	49.9	818	50.4	1141	49.6
Female	1963	50.1	805	49.6	1158	50.4
Race						
Total with race	3917	100.0	1619	100.0	2298	100.0
White	3300	84.2	1189	73.4	2111	91.9
Black	73	1.9	21	1.3	52	2.3
Asian	376	9.6	311	19.2	65	2.8
Other	168	4.3	98	6.1	70	3.0
Ethnicity						
Total with ethnicity	3917		1619		2298	
Hispanic	246	6.3	63	3.9	183	8.0
Visited a neurologist in 2007	1254	32.0	589	36.3	665	28.9

The 3,398 cases in the CMS data with service records associated only with the ICD-9 code 332.0 were all considered to have Parkinson's disease. For those 524 individuals with more than one of the parkinsonism ICD-9 codes associated with 2007 service records, the most likely diagnosis was determined by an expert in Parkinson's disease (Dr. C Tanner) using a semi-structured algorithm analogous to the method used for cases ascertained in the California Parkinson's Disease Registry. After expert adjudication of the 524 individuals with multiple ICD-9 codes, 266 were classified as most likely PD in 2007, resulting in a total of 3,656 cases believed to have PD (Table 5B) . The mean age for these PD cases was 78.06 +/- 9 years in 2007 (range 32-101). Ninety-four percent (3419/3656) were aged 65 and older, reflecting the standard age threshold for Medicare eligibility and 50 % were men (1840 men and 1816 women). 3098 (84.8%) were white, 67 (1.8%) were black, 335 (9.2%) were Asian, 152 (4.2%) were Native American or other, and 4 (0.1%) had unknown race.

Table 5B Demographic Characteristics of Expert Adjudicated "Most Likely
PD" Cases from CMS Claims Dataset

	Overall		Northern CA		Southern CA	
	n	% Total	n	% Total	n	% Total
Total	3656	100.0	1388	100.0	2268	100.0
Age						
<50	32	0.9	7	0.5	25	1.1
50-59	115	3.1	24	1.7	91	4.0
60-64	90	2.5	25	1.8	65	2.9
65-69	363	9.9	147	10.6	216	9.5
70-79	1267	34.7	480	34.6	787	34.7
80-89	1526	41.7	607	43.7	919	40.5
>=90	263	7.2	98	7.1	165	7.3

|						
>=65 subtotal	3419	93.5	1332	96.0	2087	92.0
Male	1840	50.3	716	51.6	1124	49.6
Female	1816	49.7	672	48.4	1144	50.4
Race						
Total with race	3652	100.0	1385	100.0	2267	100.0
White	3098	84.8	1017	73.4	2081	91.8
Black	67	1.8	15	1.1	52	2.3
Asian	335	9.2	270	19.5	65	2.9
Other	152	4.2	83	6.0	69	3.0
Ethnicity						
Total with ethnicity	3652		1385		2267	
Hispanic	236	6.5	54	3.9	182	8.0
Visited neurologists in 2007	1148	31.4	496	35.7	661	29.1

9. <u>Comparison of Reporting in the California PD Registry and Medicare.</u> The total count of 2007 PD prevalent individuals aged 65 and older was 5733 (Figure 5). If this is considered as the "true" 2007 prevalent population for this age stratum in the pilot regions, the PD Registry identified 73.6% of the true prevalent cases, and CMS identified 59.6% . Only about one third of cases were identified in both sources.

Figure 5. PD Cases Found By CMS, PD Registry, or Both (N=5733)
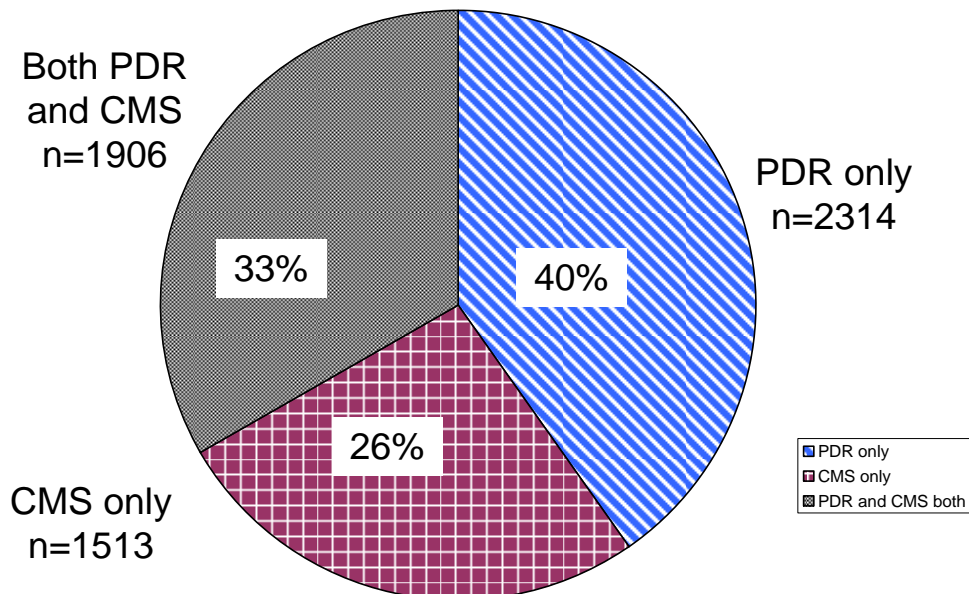
In Figure 6, the resulting estimated PD prevalence in 2007 for persons aged 65 and older is shown using each of these counts.

Figure 6. 2007 PD Prevalence per 100,000 for population aged 65 and above by Reporting Source Standardized Using US Census 2000
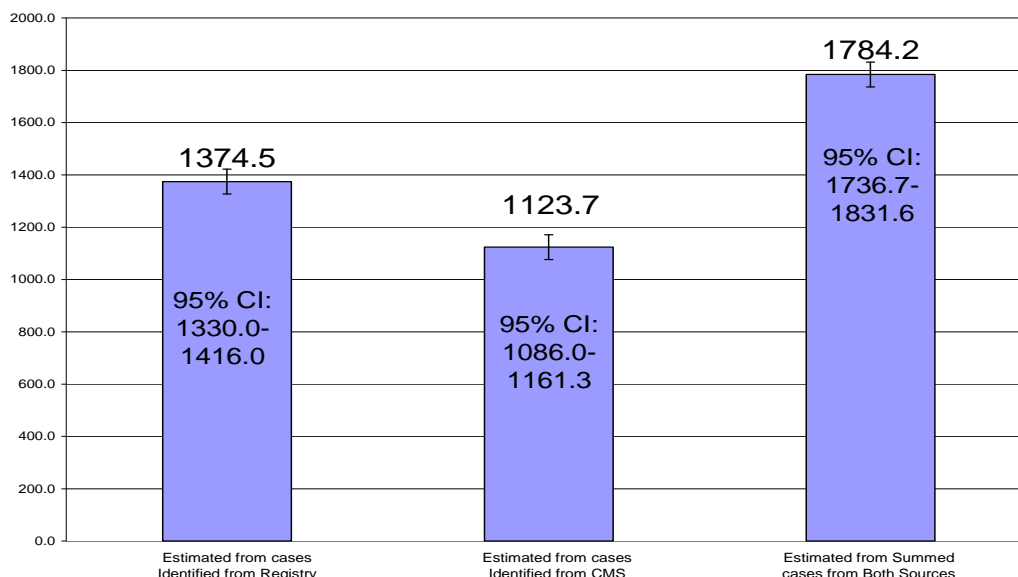
E. Conclusions

The work in this pilot project demonstrates that it is feasible to develop a public health surveillance system for Parkinson's disease using active ascertainment methods. The steps involved in this process engaged community stakeholders who offered their understanding of the importance of the effort. We established secure methods for obtaining information from many different types of providers, including providers unable to provide information in electronic format. Extensive staff training in security methods was required, and regularly reinforced, including annual re-training. Secure data storage was established and maintained with no breaches. Compliance with reporting requests was good overall, and could be expected to improve in the future as medical practices increasingly adopt electronic record systems. This level of compliance was achieved by repeated direct contact of registry staff with providers, emphasizing the importance of active ascertainment. A secure database and a system for eliminating duplicate counting of individuals was developed and implemented successfully. Methods for determining residence by calendar year 2007 were established. Algorithms for diagnostic classification were developed and implemented. The methodological infrastructure established in this study provides an efficient starting point for future ascertainment.

Prevalence estimates based on the California Parkinson's Disease Registry are similar to rates reported in other industrialized populations, and show the same male preponderance and progressive increase with age.   This is notable, because an under-estimation of the actual prevalence rate is likely, given that ascertainment could not include all providers due to limited resources. The comparison of CMS and California Parkinson's Disease Registry Pilot Project results for the same counties highlights an area needing further investigation.   Although the active ascertainment of the registry identified more cases of PD than the CMS database, even when limited to the Medicare eligible age group, the number of cases represented in both

datasets was relatively low (one third of the total cases identified were found using both methods). This may reflect, at least in part, misclassification – that is, not all cases identified may have been "true" cases of Parkinson's disease. However, it is likely that at least some of the cases "missed" by either ascertainment approach are true cases. Since the cases in the California Registry Pilot Project and in the CMS database represent those cases seeking medical care, those cases with no access to care would also have been missed. Taken together, these results suggest that Parkinson's disease may be even more common than past reports suggest.

The registered cases in the California Registry Pilot Project provide an excellent starting point for etiologic and prognostic investigations. For example, co-investigator Dr. Paul English in the California Department of Public Health has developed geographical information system (GIS) methods for mapping toxicants including use of specific pesticides and air pollution (particulate matter, diesel). This will allow investigation of the relationship between exposure and disease incidence and mortality. This work is particularly important given the large number of soldiers with similar exposures and the growing number of   older veterans.

F. References
None.

G. Bibliography of publication and meeting abstracts
Tanner CM, Jewell SA, English P, Siegel M, Roucoux DF, Wasson G, Can Den Eeden SK, Meng C, Comyns K, Albers K, Goldman SM, Nelson LM, Topol B, Bronstein J, Langston JW, Ritz B. The California Parkinson's Disease Registry Pilot Project. Presented at American Academy of Neurology 2011.

H. List of personnel
  The following is a list of personnel who have received pay from this research effort:
  Grace Bhudhikanok
  Stephanie Cash
  Kathleen Comyns
  Samuel Goldman
  Sarah Jewell
  Farah Kausar
  James William Langston
  Sarah Lavoie
  Deborah McCullough
  Chen Meng
  Brina Nguyen
  Linda Rees
  Diana Roucoux
  Maybelline Que
  Randall Soares
  Sakunthala Sundarrajan
  Caroline Tanner
  Pollyanna Troy
  Jennifer VanVeghten
  Charles Vaughan
  Jennifer Wright

The California Parkinson's Disease Registry Pilot Project in Santa Clara County, CA

CM Tanner[1,2]; SA Jewell[1,2]; P English[3]; M Siegel[4]; DF Roucoux[1]; G Wasson[5]; AJ Wasson[5]; SK Van Den Eeden[6]; C Meng[1],
K Comyns[1]; K Albers[6]; SM Goldman[1]; LM Nelson[7]; B Topol[7]; J Bronstein[8]; JW Langston[1]; B. Ritz[8]

1 The Parkinson's Institute	3 California Department of Public Health	5 Parkinson's Action Network	7 Stanford University
2 German Center for Neurodegenerative Diseases	4 American Parkinson's Disease Association	6 Kaiser Permanente	8 University of California-Los Angeles

Introduction

Population-based characteristics of Parkinson's disease (PD) are not well defined.
In late 2004, California legislation (AB 2248) was passed, making PD and parkinsonism reportable conditions.

A pilot project was initiated in 4 counties (Santa Clara, Kern, Tulare, Fresno). Results reported here are for Santa Clara County. The pilot study was conducted in partnership with the California Department of Public Health (CDPH), the Parkinson's Institute (TPI) and the University of California-Los Angeles School of Public Health (UCLA) to implement a legally mandated statewide population-based PD registry in California to serve health surveillance and research aims.

Objective: To describe the characteristics of Parkinson's disease in Santa Clara County.

CA Registry History and Timeline

- **2003:** - PD registry effort launched by patient advocates, joined by scientists.
  - Dario Frommer, Democrat, 43rd District, sponsors the registry bill.
- **2004:** - Advocates meet legislators and testify in Sacramento.
  - The California Parkinson's Disease Registry Act (AB 2248) is signed into law.
- **2006:** - AB 2248 mandated stakeholders' meeting: registry endorsed.
- **2007:** - TPI and UCLA are designated agents for CDPH.
  - AB 2248 mandated state medical and pharmacy boards to cooperate.
  - Stakeholder's Advisory Committee established.
  - Secure registry database, data collection policies and procedures established.
- **2008:** - Active ascertainment initiated.

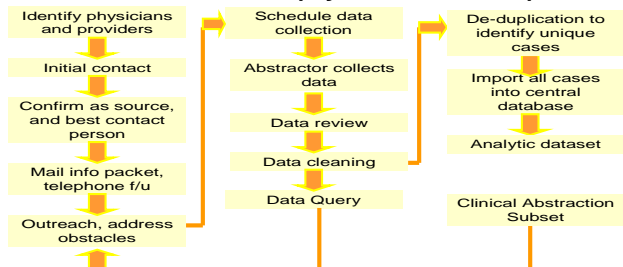## Key Features of California Parkinson's Disease Registry Act (AB 2248)

- Mandates the CDPH to register PD and parkinsonism statewide in a secure database.
- Allows CDPH to designate authorized representatives for collecting and registering cases of parkinsonism.
- Requires mandatory reporting of cases to the registry by CA providers and health care facilities.
- Requires access to records, including information on diagnosis, treatment, and course.
- Includes aim of monitoring of PD associated with suspected chemical agents encountered by the public.
- Permits no expenditure of state funds.

Methods:

Potential reporting sources were identified based on legislation:
- **Source 1:** Pharmacy records using prescription medications for PD (e.g., anticholinergics, COMT inhibitors; MAO inhibitors, amantadine, dopamine agonists, carbidopa/levodopa preparations)
- **Source 2:** Voluntary self-registration
- **Source 3:** Physicians and other providers reporting based on ICD-9 codes: Parkinson's disease (332.0); Parkinsonism secondary to drugs (332.1); Other degenerative diseases of the basal ganglia (333.0); Dementia with Lewy bodies (DLB) (331.82)

Source 3: Data Collection - physicians and other providers

- Identify physicians and providers
- Initial contact
- Confirm as source, and best contact person
- Mail info packet, telephone f/u
- Outreach, address obstacles

- Schedule data collection
- Abstractor collects data
- Data review
- Data cleaning
- Data Query

- De-duplication to identify unique cases
- Import all cases into central database
- Analytic dataset
- Clinical Abstraction Subset

Methods, continued

- **PD prevalence estimates based on the following:** 1) Parkinson's disease (332.0); 2) Residence in Santa Clara County in 2007; 3) Census 2000 population estimates for the county.

Results

Source 1: Pharmacy Records. Determining the utility of prescription data in ascertaining cases of PD.

Data from PD cases in Kaiser Permanente Northern California 2006

	% PD with Rx	% Rx with PD
Anticholinergic	10%	20%
COMT inhibitor	7%	100%
MAO inhibitor	9%	87%
Amantadine	15%	8%
DA agonist	33%	45%
Carbi/Levodopa	68%	77%

Pharmacy data were not pursued as a source for identifying cases of PD due to:
--low sensitivity and specificity;
--no diagnosis in pharmacy records;
--numerous vendors;
--no geographic link between provider and patient's place of residence.(e.g., mail order pharmacies)

Source 2: Voluntary self-registration. Number of patients reported: n = 6; number of patients eligible: n = 6.

Source 3: Physicians and other providers. Due to resource limitation, ascertainment efforts were focused on neurologists, multispecialty groups and large facilities.
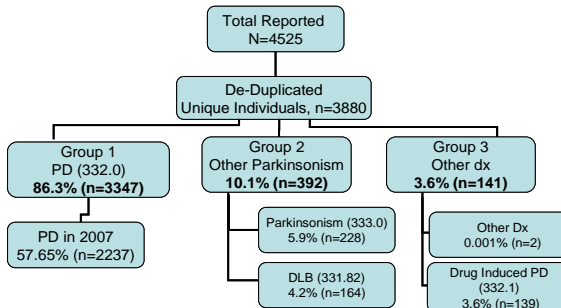
Total Providers Identified:
- **Large medical groups and facilities,** n = 6; contacted: 6; number reporting patient data: 6.
- **Neurologists (single practitioners),** n=46; eligible to report: 38; contacted: 38; number reporting patient data: 29 (11: no PD patients); unable to report patient data: 4; refused to report patient data: 5

% Cases Reported by Type of Provider/Facility:
- **Cases reported by a single source (86%):** single practitioner neurologist: 10.0%; large medical groups/facilities: 76% (By subtype: multi-specialty provider group: 13.6%; specialty referral center: 9.8%; closed HMO: 34.3%; county hospital: 12.7%; tertiary or academic hospital: 5.7%).
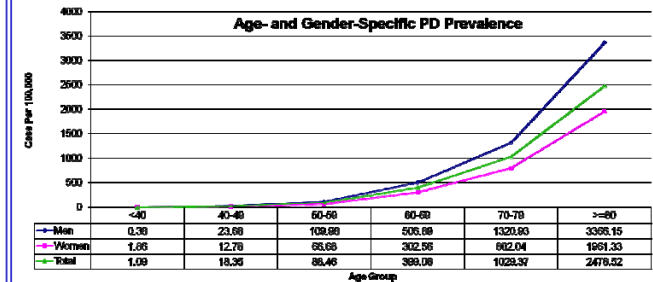- **Cases reported by multiple sources (14%):** neurologist and large med group/facility: 2.9%; more than one large medical group/facility: 11.1%.

[Flowchart]

- Total Reported N=4525
- De-Duplicated Unique Individuals, n=3880
  - Group 1 PD (332.0) **86.3% (n=3347)**
    - PD in 2007 57.65% (n=2237)
  - Group 2 Other Parkinsonism **10.1% (n=392)**
    - Parkinsonism (333.0) 5.9% (n=228)
    - DLB (331.82) 4.2% (n=164)
  - Group 3 Other dx **3.6% (n=141)**
    - Other Dx 0.001% (n=2)
    - Drug Induced PD (332.1) 3.6% (n=139)

Results, continued

Characteristics of PD cases in Santa Clara County

Total Number of Cases	2237
Age (mean)	74.8
Gender (men)	54.4%
Race (N = 1535)	
White	74.1%
Black	1.4%
Asian	19.9%
American Indian/Alaska Native	0.4%
Native Hawaiian/Pacific Islander	0.1%
Other	4.2%

Age- and Gender-Specific PD Prevalence

Age Group	<40	40-49	50-59	60-69	70-79	>=80
Men	0.38	23.68	109.98	506.98	1320.93	3366.15
Women	1.66	12.78	66.68	302.56	662.04	1961.33
Total	1.09	18.35	88.46	399.08	1029.37	2479.52

Summary & Future Work:

- Active ascertainment of PD is feasible when reporting is legally mandated. Advantages include identification of all age groups affected (vs. Medicare eligible only), verification of diagnosis and characterization of disease features and subtypes. Next steps include:
  - Comparison with CMS (Medicare) data
  - Determine efficiency of reporting sources
  - Assess diagnostic validity
  - Determine incidence of PD and related disorders
  - Correlate with concurrent environmental toxicant tracking by CDPH to investigate risk factors for PD and factors modifying PD progression

The California PD Registry will provide information useful to the proposed National Neurological Diseases Surveillance Systems (S 242).